

user or against a hard surface in a conventional manner. This imbeds the harpoon 60 in the rubber stopper 70 with the barbs 61 engaged in the stopper 70.

The needle cap 42 can then be removed and the needle N inserted into the patient. The rubber stopper 70 of the cartridge C is then moved rearward by retracting the finger ring 57 of the plunger 56 to draw body fluid into the cartridge C (aspiration) in the usual way to determine if the needle N has penetrated a blood vessel and, if not, the plunger 56 is pushed forward to discharge the medication contained in the cartridge C into the patient.

After injection, the needle N is retracted from the patient. As the syringe is withdrawn the protector case 26 may be grasped with the free hand of the user and held as the syringe is moved away from the patient thus sliding the protector case 26 forward over the needle N and into the guarded position as shown in FIG. 3. Alternatively, the protector case 26 may be operated with one hand by moving the index and middle fingers forward between the rear of the protector case actuator ring 39 and the front of the finger grip ring 13 moving the thumb rearward in the ring 57 thereby drawing the body 1 rearward into the protector case 26. As the protector case 26 slides forward, the detents 31 engage the forward detent pockets 22 preventing subsequent rearward movement of the protector case 26. The stop tabs 25 and rear edges 35b of the windows 35 provide a positive stop when moving the protector case 26 forward to cover the needle N. The entire device is then disposed of without further exposure of the needle or other action required.

The improvements which are the particular subject of the present invention are:

A modified configuration of the plunger 56 which includes the molding of the harpoon 60 as an integral part of the plunger which eliminates a separate part, simplifies the mold configuration for the plunger, and eliminates a step in the assembly process.

A new design for the molded harpoon 60 which increases the force required to pull the plunger free of the rubber stopper 70 thus reducing the incidence of inadvertent release of the stopper 70 during aspiration.

Addition of protrusions 59 on the vanes 56a of the plunger 56 and undercuts 54 in the bore of the plug 45 which interact to create an improved method of positioning the plunger relative to the plug in the second assembly.

Positioning the protrusions 59 on the vanes 56a relative to the harpoon tip 60 to provide an interaction between the protrusions and the forward wall of the plug 45 at the exit of the bore 46 through the plug to prevent the plunger 56 from being easily retracted beyond the point of interference thus substantially reducing the likelihood of the rubber piston of the medicine cartridge C being pulled free of the cartridge during the aspiration process.

Addition of an annular ring 38 to the distal end of the protector case 26 to strengthen the structure without affecting the feature which permits the needle cap 42 to be attached to the body 1 rather than the protector case 26 so as to prevent inadvertent actuation of the protector case 26 when the needle cap 42 is removed.

Modification to the angle and shape of the detents 31 on the protector case 26 and the detent pockets 22 on the body 1 to reduce the force necessary to release the detents from the rear pockets and slide the protector case forward over the needle.

While embodiments of the present invention have been shown and described, various modifications may be made

without departing from the scope of the present invention, and all such modifications and equivalents are intended to be covered.

What is claimed is:

1. A medical syringe for injecting medication into a human, comprising a syringe body, and a protector case movable with respect to the body to expose a needle connected to the body for injection and to cover the needle for disposal, the body having a cavity for receiving a medicine cartridge, the body having a first forward end to which the needle is attached and which needle also is capable of penetrating a cartridge for injecting medicine through the needle into a human, and the body having a second end into which a cartridge can be inserted.

a protector case adapted to slidably fit on the body, and having a first open end through which a needle may extend and a second end, the case and the body have cooperating detents for facilitating placement of the case with respect to the body for uncovering and covering, respectively, an exposed end of the needle, and wherein the first open end of the case is substantially cylindrical with a plurality of radially disposed slots and wherein an outer area of the first open end thereof is in the shape of a solid annular ring, and

a plunger assembly for cooperatively mating with the second end of the body and comprising a movable plunger which is movable with respect to the body for causing medicine from a cartridge to be administered through the needle, the plunger comprising a first end adapted to be manipulated by the user of the syringe and a second end adapted to be inserted into the body for engaging a stopper of a cartridge therein, the plunger being molded of plastic and the second end thereof having an integrally molded harpoon thereon which is adapted to engage and connect with a stopper of a cartridge disposed in the body.

2. A syringe as in claim 1 wherein the first end of the body for receiving a needle is tapered and includes a plurality of radially disposed fins adapted, when assembled with the case, to engage and extend through the slots in the first open end of the case.

3. A syringe as in claim 2 wherein the fins terminate in projections which are adapted to cooperatively mate with an open end of a needle cap.

4. A medical syringe for injecting medication into a human, comprising a syringe body, and a protector case movable with respect to the body to expose a needle connected to the body for injection and to cover the needle for disposal, the body having a cavity for receiving a medicine cartridge, the body having a first forward end to which the needle is attached and which needle also is capable of penetrating a cartridge for injecting medicine through the needle into a human, and the body having a second end into which a cartridge can be inserted.

a protector case adapted to slidably fit on the body, and having a first open end through which a needle may extend and a second end, the case and the body have cooperating detents for facilitating placement of the case with respect to the body for uncovering and covering, respectively, an exposed end of the needle, and

a plunger assembly for cooperatively mating with the second end of the body and comprising a movable plunger which is movable with respect to the body for causing medicine from a cartridge to be administered through the needle, the plunger comprising a first end adapted to be manipulated by the user of the syringe

and a second end adapted to be inserted into the body, for engaging a stopper of a cartridge therein, the plunger being molded of plastic and the second end thereof having an integrally molded harpoon thereon which is adapted to engage and connect with a stopper of a cartridge disposed in the body, and wherein the plunger assembly further includes a plug through which the plunger extends and wherein the plug is adapted to couple with the second end of the body, the plunger including a plurality of radially disposed vanes having protrusions thereon for engaging undercut sections in a bore of the plug for facilitating positioning the plunger relative to the plug of the plunger assembly.

5. A medical syringe for injecting medication into a human, comprising

a syringe body and a protector case movable with respect to the body to expose a needle for injection of medicine into a human and to cover the needle for disposal, and a plunger and plug assembly movable for causing medication to be injected into a human, the plunger and plug

assembly comprising an elongated plunger and a plug which are adapted to be cooperatively reciprocally coupled together and the plug being adapted to couple and become affixed to an open end of the body which open end is adapted to receive a cartridge containing medicine, and the plunger having a first end adapted to be manipulated by the user and a second end having an integrally molded harpoon thereon adapted to be coupled with and become affixed to a movable stopper of the cartridge, and wherein the plunger has a pair of protrusions thereon and the plug has a bore with a pair of indentations wherein the protrusions interact with the indentations during handling, packaging and shipping of the plunger and plug, and the plug having a face which interacts with the protrusions of the plunger to limit the retraction of the plunger once the harpoon thereof becomes affixed to the stopper of the cartridge.

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